SEVERAL NEW SILURIAN CEPHALOPODS AND CRINOIDS, CHIEFLY FROM OHIO AND HUDSON BAY

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A. CEPHALOPODS

In 1927 a paper on the Ordovician and Silurian Cephalopods of the Hudson Bay Area was published by Aug. F. Foerste and T. E. Savage, in volume 22 of the Denison University Bulletin, Journal of the Scientific Laboratories. Since that time several specimens, collected by Professors Savage and Van Tuyl, have turned up and are described here.

Among these are two specimens from the Port Nelson limestone, described here under *Osbornoceras savagei.* These are of interest chiefly on account of their apparent similarity exteriorly to the genotype of *Osbornoceras*, namely, *Osbornoceras swinnertoni*, recently found in the Brassfield limestone in southwestern Ohio.

The Port Nelson limestone includes all of those Silurian strata in the Hudson Bay area which are below the top of the layers containing *Virginia decussata.* A few feet above this *Virgiana decussata* horizon there is a zone containing *Camarotoechia* (?) *winiskensis* Whiteaves, *Pterinea occidentalis* Whiteaves, *Isochilina latimarginata* Jones, and *Leperditia hisingeri fabulina* Jones. This horizon is included in the Severn River limestone. Both horizons occur at the Grand Rapids of the Saskatchewan river, near the northwestern margin of Lake Winnipeg. The fossils characteristic of the Severn River limestone occur also in the Wabi formation of the Lake Timiskaming area. In the northern peninsula of Michigan the fossils characteristic of the Severn River limestone overlie those containing *Virgiana mayvillensis* Savage, the latter being characteristic of the uppermost layers of the Mayville limestone in eastern Wisconsin.

The Port Nelson and Severn River formations are regarded as northern or Arctic invasions, while the Brassfield is regarded as a southern invasion. Both, however, are regarded as belonging to the Alexandrian division of the Silurian of Savage. Under these circumstances, the apparent occurrence of a species

in the Port Nelson formation of the Hudson Bay area congeneric with *Osbornoceras swinnertoni* of the Brassfield of southwestern Ohio is of considerable interest.

In the northern peninsula of Michigan the equivalent of the Severn River formation is known as the Burnt Bluff formation. The only cephalopod known hitherto from the Severn River formation of the Hudson Bay area was *Phragmoceras severnense* Foerste. Here *Laphamoceras vantuyli* is added. Unfortunately the structure of the interior of the latter is unknown.

Nine species are known from the overlying Ekwan River formation of the Hudson Bay area, and none is added here. Savage correlated this formation with the Manistique of northern Michigan, though its cephalopods suggest the upper part of the Burnt Bluff formation.

From the Attawapiskat formation 22 species of cephalopods were known, and two new species are added here. This formation appears to correspond approximately to the Racine in the presence of such genera as *Pentameroceras*, *Octameroceras*, and *Phragmoceras*, but not a single species of cephalopod can be identified definitely from both. Moreover, the Ekwan and Attawapiskat formations are regarded as northern invasions, while the typical Racine is not known north of the Milwaukee area of Wisconsin. The Racine, on the contrary, is represented by numerous identical species in the Cedarville formation of southwestern Ohio, and there are closely affiliated faunas in northwestern Ohio, southern Ontario, and northwestern New York. The known distribution of the Racine fauna is distinctly south of the Canadian shield, nothing similar to this fauna being known at present anywhere in subarctic or arctic areas.

1. **Orthoceras (?) attawapiskatense** new species

(Plate I, Fig. 7; Text Fig. 3)

The holotype is a small fragment of a conch including only a single camera and part of a second camera, but the septa of these two camerae are so peculiar in form as to provide a ready means of identification of the species. Each of the two camerae is about 6 mm. long. The cross section is circular; the diameter being 23 mm. The sutures of the septa appear straight and directly transverse. The septa are funnel-shaped, the sides diverging from each other at an angle of 56 degrees. The vertical length of these funnels is 17 mm. The smallest diameter preserved at their base is 5.5 mm. The center of this basal part is 8 mm. from the nearest wall of the conch, or 3.5 mm. from the center of the conch. In consequence, one side of the funnel is 20 mm. long, while the length of the opposite side is about 15 mm. Smoothing the

basal part of the funnel reveals a ring-like structure 4 mm. in diameter. This may indicate the size of the siphuncle, but the latter is not outlined definitely. The surface of the shell apparently was smooth. The rate of enlargement of the conch can not be determined with accuracy, but it appears to have been small.

Occurrence—Ekwan River, west of the northern end of James Bay, Canada, 38 miles above the mouth of this river, and two miles above the mouth of Strong River, half a mile below locality 903 of Savage and Van Tuyl. From the Attawapiskat limestone. Collected by T. E. Savage.

Remarks—The funnel-like form of the septa is anomalous among orthoceroids. At first glance it resembles the pseudosepta figured by Barrande in the case of various Silurian species found in Bohemia, but in the Hudson Bay specimen this form is characteristic of the septa themselves. The siphuncle is exposed only in cross section at the base of one of the funnels. Its segments are assumed to be nearly cylindrical, if enlarged at all within the camerae.

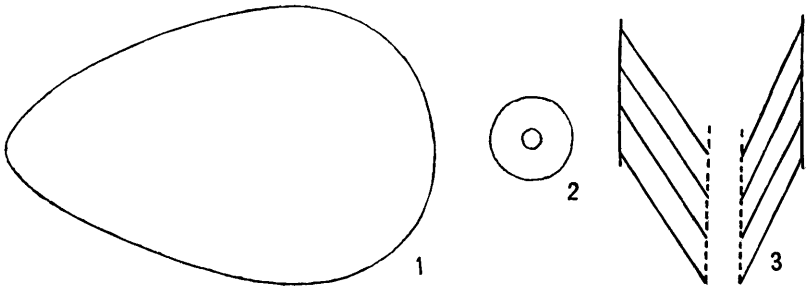

FIG. 1. *Osbornoceras swinnertoni;* cross-section of conch.
FIG. 2. *Spyroceras savagei;* cross-section showing siphuncle.
FIG. 3. *Orthoceras attawapiskatense;* vertical section showing septa and siphuncle.

2. **Spyroceras (?) savagei** new species

(Plate I, Figs. 3, 4; Text Fig. 2)

The holotype is 34 mm. long, 13 mm. of this length belonging to the living chamber. Its lateral diameter enlarges from 11.5 mm. near its base to 13.5 mm. at a point 25 mm. farther up. At the upper point mentioned its dorsoventral diameter is 2.5 mm., the conch being slightly depressed in that direction. At the top of the phragmacone, where its lateral diameter is 13 mm., there are 5 camerae in a length of 14 mm. The sutures of the septa are directly transverse. At the base of the specimen, the concavity of the septum is 1.6 mm. The diameter of the siphuncle here is 2.5 mm. Its segments are cylindrical in form, and there is no contraction at the septal necks. The location of the siphuncle is central. The surface of the shell is striated conspicuously both vertically and transversely. The vertical striae or ribs are more prominent, rising higher than the transverse ones. The more prominent of these number about 40 or 45 within the circumference of the conch.

On some parts of the surface there are less prominent vertical striae, alternating with the more prominent ones. Not enough of the surface of the shell is preserved to determine to what extent this alternation takes place. At one point, where 4 vertical striae occur in a width of 2.25 mm., there are 6 transverse ones in a length of 2.5 mm. The latter are less elevated, and hence less conspicuous. There are no distinct annulations, as in typical *Spyroceras*. Such annulations as exist are so faint as to be almost obsolete. They can be counted only along the living chamber, where the crests of 4 annulations occur in a length of 12.5 mm., the diameter of the conch here being about 13.5 mm.

Occurrence—Severn River, southwest of Hudson Bay, in the northern part of the Province of Ontario, Canada; near Limestone Island. From the Attawapiskat limestone. Collected by T. E. Savage.

Remarks—Among species already described, the one most nearly resembling this Hudson Bay specimen is the one described by Barrande[1] under the name *Orthoceras patronus* from the Devonian of Konieprus, Bohemia. In this Bohemian species the annulation is only slightly more distinct. The vertical ribbing or striation is closely similar, but the specimen figured first has more numerous transverse raised lines.

3. **Laphamoceras (?) vantuyli** new species

(Plate I, Figs. 5, 6)

Conch 48 mm. long, measured along its convex ventral outline. The radius of curvature of its convex ventral outline is about 35 mm. The specimen is crushed laterally. In its present condition its dorsoventral diameter increases from 7.5 mm. at its base to 15 mm. at a point 38 mm. farther up. At this upper point its present lateral diameter is 11 mm., but originally the lateral compression of the conch probably was moderate. Sutures of septa can be detected only between 8 and 19 mm. above the base of the specimen. At a dorsoventral diameter of 11 mm. there are about 7 camerae in a length of 10.5 mm. ventrally. The sutures of these septa are relatively straight and rise but slightly in a ventrad direction. No trace of the siphuncle is exposed, though, from the narrowness and depth of the hyponomic sinus this siphuncle is assumed to have been located close to the ventral outline of the conch. The length of the living chamber is unknown. The surface of the shell is both banded and striated transverse, the two types of ornamentation being parallel to each other. These markings are well preserved along the upper half of the specimen. Laterally they are almost straight, apparently rising in a ventrad direction. On approaching the ventral outline, however, they curve rapidly and increasingly downward, showing former locations of the hyponomic sinus. Along the upper part of the conch this sinus was V-shaped, about 6.5 mm. wide and 2 mm. deep, its basal outline rather narrowly rounded. There is a tendency toward angulation along the median part of the ventral side of the conch. Here the transverse bands tend to remain distinct, while the transverse striae become less sharply defined, or become obsolete locally.

[1]Joachim Barraude. Systeme silurien du centre de la Boheme, Vol. 2, Pl. 275, Figs. 20–28 (1868).

Occurrence—From a loose boulder of Severn River limestone, presumably from Severn River, southwest of Hudson Bay. Collected by T. E. Savage.

Remarks—The genus *Laphamoceras* was founded on an Ordovician species, *Cyrtoceras tenuistriatum* Hall, from the Platteville member of the Black River. In it there are numerous closely crowded transverse striae which curve downward ventrally into a distinct V-shaped sinus. The resemblance of the Hudson Bay specimen to the Black River genotype probably is confined to its external features.

OSBORNOCERAS new genus

Genotype: *Osbornoceras swinnertoni* Foerste.

Cyrtoceracones cuneate-ovate in cross section, narrowly rounded ventrally, much more broadly rounded dorsally. Sutures of septa rising distinctly higher ventrally than dorsally. Siphuncle located near the ventral outline of the conch but not in contact with the latter; segments elongated vertically, nearly twice as long as wide, enlarging only moderately within the camerae, their dorsal outlines nearly straight, their ventral outlines distinctly though moderately convex. Living chamber contracting both dorsoventrally and laterally toward the aperture; lateral margins of the aperture curving upward, sloping strongly downward ventrally, indicating a relatively deep and narrow hyponomic sinus. Dorsal side of aperture uncertain.

Known at present only from the Alexandrian division of the Silurian.

4. **Osbornoceras swinnertoni** n. sp.

(Plate I, Figs. 1, 2; Text Fig. 1)

Specimen 126 millimeters long in a direct line, but about 162 mm. long when measured along its convex ventral outline. The radius of curvature of this ventral outline is 75 millimeters along the phragmacone and approximately the same along the living chamber. The corresponding radius of curvature of the concave dorsal outline is 50 mm. The maximum length of the living chamber along the median part of its lateral side is 67 mm. The dorsoventral diameter of the conch enlarges from 38 mm. at the base of the specimen to 55 mm. at the base of the living chamber, which is 105 mm. farther up when measured along its ventral outline. Apparently there is a slight contraction dorsoventrally along the upper part of the living chamber, but the ventral outline of this part of the chamber is not preserved. The lateral diameter of the conch enlarges from about 22.5 mm. at the base of the specimen to 38 mm. at the base of the living chamber, contracting to 32 mm. at its top. The cross section of the conch is cuneate. At the base of the living chamber, where its dorsoventral diameter is 55 millimeters, the maximum lateral diameter of the conch is located 20 mm. from its concave dorsal outline. The dorsal side of the cross section of the conch at the base of the living chamber has a radius of transverse curvature of 20 mm. The corresponding radius of transverse curvature of its narrow ventral edge is 5 mm. The ventrolateral sides are strongly flattened and converge

strongly toward the ventral outline of the conch. The number of camerae in a length equal to the dorsoventral diameter of the conch varies from 6 at a diameter of 49 mm. to a little over 7 at a diameter of 55 mm. The sutures of the septa curve downward laterally, their maximum downward curvature being located at the maximum lateral diameter of the conch. In a dorsad direction these sutures rise only slightly. In a ventrad direction they rise at an increasing rate on approaching the base of the living chamber, attaining an elevation of 10 or 12 mm. above the lowest part of their course at the top of the phragmacone. The passage of the siphuncle through the septum at a point 50 mm. beneath the ventral side of the base of the living chamber is 2 mm. in diameter, enlarging to 4 mm. within the camerae. The septal necks are about 1 mm. long, and contract strongly along their dorsal sides, but much less ventrally. The dorsal outline of the connecting rings is almost straight, but their ventral outline is distinctly convex. Faint traces of transverse undulations of growth cross the surface of the cast of the interior of the living chamber. These undulations curve upward along the lateral sides of the chamber, reaching their greatest elevation near the maximum lateral diameter of the conch. Thence they curve downward about 20 mm. in a ventrad direction, but only slightly in a dorsad direction. From this it is assumed that the hyponomic sinus was long, deep, and narrow. The shell appears to have attained a thickness of 1.5 mm. along the dorsal side of the living chamber, thinning to less than half a millimeter ventrally. The surface of the shell apparently was smooth.

Occurrence: From the Brassfield limestone, in the quarry of the Southwestern Portland Cement Company, about one-third of a mile southeast of Osborn, in the northwestern corner of Greene County, Ohio. Collected by Theodore Sawyer and donated by Prof. A. C. Swinnerton. U. S. National Museum No. 91091.

5. **Osbornoceras (?) savagei** n. sp.

(Plate II, Fig. 1)

Specimen 120 mm. long in a direct line, but about 131 mm. long when measured along its ventral outline. Along this ventral outline the phragmacone occupies a length of 57 mm., and the living chamber a length of 74 mm. as far as the lower margin of the hyponomic sinus. The radius of curvature of the convex ventral outline is 100 mm. The dorsoventral diameter of the conch enlarges from 44 mm. at its base to 50 mm. at the base of the ventral side of the living chamber, to 51 mm. at a point 45 mm. farther up, and then diminishes to 45 mm. at the lower margin of the hyponomic sinus after an additional interval of 29 mm., the dorsoventral contraction here being due chiefly to a slight incurvature of the ventral outline of the chamber. The original cross section of the specimen is assumed to have been similar to that of the genotype, *Osbornoceras swinnertoni*, with the general form cuneate, the dorsal side more broadly rounded, and the ventrolateral sides converging strongly toward the much more narrowly rounded ventral part of the section. At present, however, this cross section is more

compressed laterally, especially along its dorsal side, so that the lateral diameter of the conch is estimated at 18 mm. at its base, and increases thence to about 24 mm. at a point 25 mm. above the base of the living chamber, diminishing to about 18 mm. at the aperture. Along the ventral side of the lower part of the living chamber the more narrowly curved part of the ventral side of this cross section has a radius of curvature of 3 or 4 mm., while dorsally the corresponding radius is approximately 7.5 mm. In consequence, the cross section of this specimen is more lenticular than cuneate, but with the dorsal side more broadly rounded. Nine camerae are preserved. Of these, the upper three occupy a total length of 18 mm. ventrally, the intermediate three of 22 mm., and the lower three of 17 mm. The sutures of the septa curve only slightly downward along the dorsal half of their course, but rise distinctly along their ventral half, the amount of this rise equalling about 9 mm. along the upper part of the phragmacone. The siphuncle is not preserved but is assumed to be located as in the genotype. The lateral margin of the aperture appears to rise upward, attaining its greatest elevation dorsad of the center of the conch. Its downward curvature in a ventrad direction equals about 8 mm., indicating the former presence of a long and narrow V-shaped hyponomic sinus. In a dorsad direction the downward curvature of this margin appears much less. The surface of the shell is not preserved distinctly, but appears to have been smooth.

Occurrence: From 4 miles above the Lower Rapids of the Nelson River, 18 miles below the mouth of Limestone River; from the Port Nelson limestone.

Remarks: Osbornoceras savagei differs from *Osbornoceras swinnertoni* in the smaller lengthwise curvature of its conch, the smaller rate of enlargement of its phragmacone dorsoventrally, the greater length of its living chamber, and the less rapid rise of the sutures of its septa along the ventral half of their course. The more narrow rounding of the dorsal side of its cross section is ascribed to compression of the conch after the death of the animal.

6. **Phragmoceroid (?)**

(Plate II, Fig. 2)

A second specimen, from the same locality and horizon as *Osbornoceras savagei*, appears to be more erect, its right outline as figured being slightly convex. The living chamber is shorter and the left part of its upper margin appears contracted, as though outlining the dorsal lobe of the aperture of some phragmoceroid. However, there is no evidence that the right side of its aperture projected in the form of a spout similar to the hyponomic sinus of phragmoceroids. Therefore the systematic position remains in doubt. It is figured here in contrast with typical *Osbornoceras savagei*, both being from the Port Nelson limestone, 4 miles below the Lower Rapids of the Nelson River.

OXYGONIOCERAS Foerste

Genotype: *Trochoceras oxynotum* Barrande, Systeme Silurien du Centre de la Boheme, Vol. 2, p. 91, Pl. 14, Figs. 1–11 (1867); *Oxygonioceras oxynotum* Foerste, Jour. Sci. Labs. Denison Univ., Vol. 21, p. 62 (1926); Vol. 21, p. 375, Pl. 42, Figs. 1 A-E (1926).

Cross section of conch ovate cuneate, with the ventral side narrowly but not sharply rounded, the dorsal side much more broadly rounded. Conch curved lengthwise, the siphuncle located on its convex outline. In the genotype the segments of the siphuncle enlarge strongly within the camerae, their lateral diameter equallin about 1.7 times their height. This genotype is from the Middle Silurian of Bohemia, at present a part of Czechoslovakia.

7. Oxygonioceras (?) cuneatum (Whiteaves)

Cytoceras (?) *cuneatum* Whiteaves. Geol. Surv. Canada, Vol. 3, Pt. 4, p. 282 (1906); Ottawa Naturalist, Vol. 20, p. 133. Text Figs. A, B, (1906).
Oxygonioceras cuneatum Foerste. Jour. Sci. Labs., Denison Univ., Vol. 21, p. 63 (1925)

The holotype is from the Silurian at Stonewall, Manitoba. Regarding the location of its siphuncle Whiteaves stated: "Shape and position of siphuncle not very clearly defined in the only specimen collected, though at the smaller end thereof there are indications that it was eccentric and placed a little on the ventral side of the center, as represented in Fig. B." In this Figure, published in the *Ottawa Naturalist*, the dorsoventral diameter of the conch is drawn as 27.5 mm. long, the passage of the siphuncle through the septum being almost 2 mm. in diameter, and its center being 10.5 mm. from the cuneate ventral side of the conch.

Unfortunately this holotype has been lost, so that the subcentral location of the siphuncle can not be verified. Usually cyrtoceroids with a subangular ventral outline have the siphuncle located near the convex ventral outline of the conch, and a subcentral location of the siphuncle should not be accepted unless clearly indicated. Whiteaves's statement that the shape and position of the siphuncle are not very clearly indicated increase the uncertainty as to the subcentral location of the latter. In other words, there is a possibility that the siphuncle in this species was located near its subangular convex outline, as in *Oxygonioceras*. Should, however, the subcentral location of the siphuncle ever be verified then the Stonewall specimen would necessarily be excluded from *Oxygonioceras*.

8. Oxygonioceras (?) wabashense n. sp.

Oxygonioceras cf. *cuneatum* Foerste. Notes on cephalopod genera; chiefly coiled Silurian forms. Jour. Sci. Lab., Denison Univ., Vol. 21, p. 63, Pl. 21, Figs. 1A, B, C, (1925).

The specimen from the Niagaran at Wabash, Indiana, differs from the species originally described by Whiteaves as *Cyrtoceras cuneatum* in its less rapid rate of curvature lengthwise, and in the greater number of camerae in a length equal to the dorsoventral diameter of the conch. In its present condition, the dorsal side of the cross section of the conch

is much more angular along its median line, but this feature may be due in part to lateral compression of the conch after the death of the animal.

B. BRASSFIELD CRINOIDS

Unidentifiable fragments of crinoids are common in the upper part of the Brassfield formation in Ohio and Kentucky east of the Cincinnati anticline; however, remains at least generically identifiable are rare, and specimens suitable for the erection of species are still rarer. The little that was known in 1919 was included in a paper on the Echinodermata of the Brassfield (Silurian) Formation in Ohio published by the writer in volume 19 of the Denison University Bulletin, Journal of the Scientific Laboratories.

Most characteristic of these crinoidal remains are numerous detached flat columnals, often attaining diameters of 12 or 13 mm., but occasionally equalling 22 mm. and even 28 mm. in diameter. These columnals are specially common at the top of the Brassfield. Rarely these columnals are found still forming a continuous stem. The stem illustrated in the publication cited above was a little over 150 mm. long and formed a loose flat coil 41 mm. in diameter with its smaller end at the center. This stem enlarged in diameter from slightly over 1 mm. at its smaller end to about 8 mm. at its top. Short strands of larger columnals also occur, evidently fragments of much longer stems. Unfortunately, no calices which could belong to these stems have been found. The loose columnals occur from Dayton, Ohio, southward as far as the Cumberland River, in the southwestern part of Pulaski County, Kentucky.

A single stem, described as *Eomyelodactylus rotundatus* Foerste, was found on Caesar Creek, nearly five miles southeast of Xenia, Ohio. Parts of calices, described as *Dimerocrinus* (?) *vagans* Foerste, were found seven miles northwest of Xenia, at a locality reached by going from Byron one mile east and then one mile south, east of the road. Here also was found the specimen described as *Stereoaster squamosus*, but the latter at present is regarded as merely the badly weathered under side of the tegmen of some unknown crinoid.

Fragments of calices have turned up more frequently in the upper part of the large quarry at Centerville, Ohio, than elsewhere. Occasionally a good head is found. One of these was described in the publication mentioned above merely as

Clidochirus sp., since it was discovered before publication that Springer already had figured another specimen belonging to the same species under the name *Clidochirus americanus*. At present three specimens of this species are in the U. S. National Museum.

Among the other specimens figured from the Centerville quarry in the publication cited above the one doubtfully identified as a Platycrinid may be a *Patelliocrinus*, and that doubtfully referred to *Cyathocrinus* may be a *Pycnosaccus*. Until better preserved specimens are found their exact relationship must remain in doubt.

Recently two specimens were found in the upper part of the Brassfield formation at Centerville which evidently belong to the Calceocrinidae. Both are alike in having a median arm which branches on the fifth primibrach. However, in the smaller specimen this arm branches again on the third secundibrach, while in the larger specimen this branching can not take place earlier than the fourth secundibrach, and may take place later, as far as can be determined from the specimen at hand in which the sutures above the fourth secundibrach are poorly defined. In the smaller specimen the lateral arms present five erect branches of the type described in full by Springer for the genera *Calceocrinus* and *Halysiocrinus*. In the larger specimen, however, it is impossible to determine definitely whether the lateral arms branch as in *Eucheirocrinus* or as in *Calceocrinus*. Of the branches of the lateral arms only those nearest the median arm are preserved distinctly, and these in their present state of preservation could be referred to *Eucheirocrinus* almost as readily as to *Calceocrinus*. In the smaller specimen the brachs of the median arm are much more compressed laterally than in the larger one; moreover the upper parts of both the median and the lateral arms curve more strongly toward the posterior side of the crown. The sutures separating the basals are poorly indicated, but apparently there are only three basals. In both specimens the two segments of the radial supporting the median arm appear to be in narrow contact with each other. In the smaller specimen the columnals of the stem appear to become moderately longer in a distal direction, while those of the larger specimen are subequal.

Owing to the differences here noted the smaller specimen is described as *Calceocrinus centervillensis*, while the larger one is separated as *Calceocrinus* (?) *incertus*.

9. **Calceocrinus centervillensis** new species

(Plate II, Figs. 3, 4)

The holotype is 17.5 mm. long, 5.5 mm. of this length belonging to the calyx. Apparently only 3 basals are present, no suture being detected along the middle of the median triangular basal. The apex of this plate is very near the base of the stem, but apparently it is not in actual contact with the latter. The two segments of the radial supporting the median arm apparently are in very narrow contact with each other, but sutures here are very indistinct. The brachials of the median arm are strongly convex transversely and their outer surface is minutely granulate. This arm branches on its fifth primibrach. Only the right branch is preserved and this branches on its third secundibrach. The main axis of the lateral arms rises at a strong angle and gives rise to 5 erect branches. These erect branches divide heterotomously, one of the two branches usually being distinctly smaller than the other. These smaller branches are formed alternately first on one side of the larger branch then on its opposite side. Unfortunately, in the specimen at hand, only glimpses of the smaller branches are secured as a rule, and not infrequently the sutures between the brachs are not distinct. The stem is preserved for a length of 5.5 mm. The columnals apparently enlarge in a distad direction.

Occurrence: Quarry northeast of Centerville, Ohio. From the clay layers at the top of the Brassfield formation. U. S. National Museum, No. 91093.

10. **Calceocrinus (?) incertus** new species

(Plate II, Figs. 5, 6, 7, 8)

The holotype is 28 mm. long, 7.5 mm. of this length belonging to the calyx. This calyx narrows from a width of nearly 7 mm. near its base to 6 mm. a short distance beneath its top. The gap between the basals and radials is lenticular in outline and is 6 mm. wide and 1.5 mm. long. Apparently there is only a single median triangular basal. The two segments of the radial supporting the median arm apparently meet at a point. This median arm branches on its fifth primibrach. Both branches present a straight transverse suture at the top of the third secundibrach; each may have branched on the fourth secundibrach, but that is uncertain. The proximal erect branch of the right lateral arm branches several times, but it is impossible to determine whether this branching is similar to that of *Calceocrinus* or of *Eucheirocrinus*. Apparently the primary part of this right lateral arm arises as in *Calceocrinus centervillensis*, giving off vertical branches, but this can not be determined definitely. The brachials of both the median and lateral arms are less convex than in the preceding species. The surface of both calyx and arms is granulate, the granules being preserved locally. The stem is preserved for a length of 8 mm. Throughout this length its segments are short and disc-like, the crests of 5 columnals occurring in a length of 2 mm., the diameter of the stem being 1.6 mm.

Occurrence: Quarry at the northeast margin of Centerville, Ohio. From clay layers at the top of the Brassfield formation. U. S. National Museum, No. 91092.

EXPLANATION OF PLATES

PLATE I

Figs. 1, 2. *Osbornoceras swinnertoni* Foerste. 1, lateral view with ventral outline on left; 2, dorsoventral section through siphuncle, oriented as in Fig. 1. Osborn, Ohio; from Brassfield limestone. See also Text Fig. 1. U. S. National Museum, No. 91091.

Figs. 3, 4. *Spyroceras* (?) *savagei* Foerste. 3, natural size; 4, same, enlarged three diameters, slightly turned toward right. Severn River, near Limestone Island, Hudson Bay area; from Attawapiskat limestone. See also Text Fig. 2. Savage collection.

Figs. 5, 6. *Laphamoceras* (?) *vantuyli* Foerste. 6, lateral view with ventral outline on left; 6, oblique dorsal view showing downward curvature of transverse striae along former locations of hyponomic sinus. Loose boulder, Severn River, Hudson Bay area; from Severn River limestone. Savage collection.

Fig. 7. *Orthoceras* (?) *attawapiskatense* Foerste. Lateral view, showing funnel-shaped septum at its base. Ekwan River, two miles above Strong River, Hudson Bay area; from Attawapiskat limestone. See also Text Fig. 3. Savage collection.

PLATE II

Fig. 1. *Osbornoceras* (?) *savagei* Foerste. Lateral view with left outline regarded as ventral. Four miles above Lower Rapids of Nelson River; from Port Nelson limestone. Savage collection.

Fig. 2. *Phragmoceroid* (?). Lateral view, oriented as in preceding figure. Four miles above Lower Rapids of Nelson River; from Port Nelson limestone. Savage collection

Figs. 3, 4. *Calceocrinus centervillensis* Foerste. 3, showing calyx and median arm; 4, lateral view with median arm on left; also 5 vertical branches of right lateral arm. Quarry on northeast margin of Centerville, Ohio; from top of Brassfield formation. U. S. National Museum, No. 91093.

Figs. 5, 6, 7, 8. *Calceocrinus incertus* Foerste. 5, showing calyx, median arm, and adjacent parts of the two lateral arms; 6, left side, showing calyx with stem on left side, and with median arm on right outline, also adjacent part of left lateral arm; 7, posterior side of calyx showing the stem attached to its base and curved upward parallel to the calyx; 8, calyx viewed from beneath and showing the gap at the hinge between the basals and the radials, stem attached to the basals and curving strongly upward, parallel to the posterior side of the calyx. Quarry at northeastern margin of Centerville, Ohio; from the top of the Brassfield limestone. U. S. National Museum, No. 91092.


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